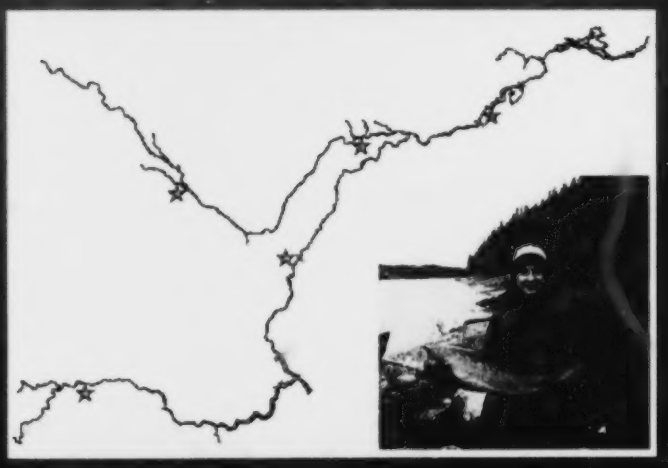
Saskatchewan
Environment

Historical and present locations of lake sturgeon in Saskatchewan

Fish and Wildlife Technical Report 2003 - 2



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HISTORICAL AND PRESENT LOCATIONS OF LAKE STURGEON (Acipenser fulvescens) IN SASKATCHEWAN

by

Christine G. Smith

Canadian Plains Research Center (CPRC)

and

Saskatchewan Environment (SE)

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EXECUTIVE SUMMARY

In Saskatchewan, lake sturgeon are distributed along the South and North Saskatchewan Rivers upstream into Alberta, and the Saskatchewan River downstream into Manitoba. Resource agencies in several provinces are concerned that lake sturgeon have declined due to harvesting and habitat changes. Alberta considers the western sub-populations in the South and North Saskatchewan Rivers are near or below the critical densities to sustain their populations. Reviews by species-at-risk committees are presently underway federally and provincially.

In the summer of 2002, over 150 people were contacted for information on sturgeon locations, sizes, seasons, and fishing. Over 100 fishing sites along the three Saskatchewan Rivers were located and assessed for sturgeon feeding, over-wintering, spawning, and rearing potential. The majority of the locations assessed so far are potential feeding and spawning sites. Historical accounts from explorer diaries (dating back to 1775), previous river surveys and local anglers provided some information on locations and catches.

Comments on "present" fishing in the report refer to recent past years or incidental catches. Anglers who catch sturgeon have been required to release them immediately since 1999. Previously, angling limits had been one sturgeon daily and two in possession.

Preferred angling gear for sturgeon included heavy-duty rods, reels, lines and hooks. Minnows and leeches were chosen for bait most frequently however, any kind of smelly lure would suffice. Lake sturgeon are generally opportunistic feeders and will examine all potential prey along the river bottom. Natural foods include a variety of insect larvae, clams, snails, freshwater shrimp, fish, and plant debris.

Anglers report spring and fall are the optimal seasons for catching sturgeon, although more were caught in the summer because of increased angler numbers.

The majority of present sizes ranged from 5 to 25 pounds and the largest sizes were in the 30 to 40 pound range. Anglers report that 50 to 60 pound sturgeon are not as common today as they were a few decades ago. Explorer diaries did not frequently report sizes.

In the South Saskatchewan River, many reports of sturgeon came from the Leader area. The area between the Gardiner Dam and Saskatoon is sparse in diversity and abundance for all fish species and invertebrates. Both the North Saskatchewan and Saskatchewan rivers have numerous locations for sturgeon distributed throughout their entire length.

Many anglers considered the rivers higher and in much better condition with higher numbers of sturgeon and other species 10 to 15 years ago. Federal data shows a general decline in annual flows between 1913 and 1993. Spring and summer flows declined significantly at Saskatoon and The Pas.

Sturgeon prefer fast flowing rapids with rock or cobble substrate for spawning, with deep holes nearby for feeding and congregating. In the South Saskatchewan River, a few sites in Alberta and many sites downstream towards Leader are potentially suitable. From Saskatoon to The Forks, spawning may occur near ferry locations. Potential spawning sites were noted throughout the entire range of the North Saskatchewan River and some in the Saskatchewan River downstream of EBCampbell dam.

Rearing habitat for juveniles include areas of coarse-sand and pea-sized gravel, generally near mouths of rivers. Literature suggests there are rearing areas in the South Saskatchewan River in parts of Alberta and at least four others downstream to Fenton ferry. No potential rearing habitat has yet been identified in the in the North Saskatchewan River in the Saskatchewan River only three sites have been identified.

Three characteristics are essential for healthy sturgeon populations. Habitat that is suitable for all life stages must be found. Sizes and ages should include some 70 year-old females and 40 year-old males. Lastly there should be at least a minimum number of spawners to sustain the population in each river.

Recommendations include fieldwork for relative abundance, size data, and habitat suitability. Locations for field work include the Leader and Muskoday areas in the South Saskatchewan, and the Lloydminster, Battleford, Maymont/Borden and Prince Albert areas in the North Saskatchewan. Some of these sites have historical data for comparisons of sizes, numbers, and past conditions of rivers.

ACKNOWLEDGEMENTS

Sincere gratitude goes out to all those who were contacted during this study for their time and helpfulness. Long hours were spent conducting telephone interviews, with the majority more than happy to contribute. Personal interviews were conducted with a few expert anglers in each region. In the Leader area, thanks go out to Fred Jadiske and his family, Ian Davidson, Gary Story and Dave Leopard from Eston. In the Lloydminster, area special thanks go to Brent Kendel and in Saskatoon, Rob Rose and Jaroslav Zufka and his son. Thanks go out to those in the Nipawin area, especially Les Hoppe and Dwayne and Jeffrey Drake.

Conservation Officers Al Winarsky, Kevin Fitzsimmonds, Les Olsen, Rob Grainger, and Jamie Chartrand fueled expeditions along the rivers to indicate local fishing sites and other significant areas. I'd also like to thank Lyle Wallin, Howard McKenzie, and Joe Fiddler for allowing me to join them while test netting in the Saskatchewan River, June of 2002. The Saskatchewan River Sturgeon Management Board allowed me to sit in on their meeting in June 2002. Hamilton Greenwood of SIAST in Prince Alberta contributed much local knowledge and historical literature. Daryl Watters of Alberta's Sustainable Resource Development (SRD) contributed his knowledge and extensive population data for the North Saskatchewan River. All their comments and suggestions were greatly appreciated.

Endless thanks goes out to the many staff of Saskatchewan Environment for all their assistance and kindness. Those from Saskatoon include Lois Koback and Bill Sawchyn who were generous with their time and knowledge of the mapping systems used and Rob Wallace for sharing his sturgeon expertise of the lower Saskatchewan as well as his editorial comments on the report.

A great deal of gratitude also goes out to those from Regina including Steve Porter for the creation of the database, Dr. Paul James for his help and advising and lastly, the Canadian Plains Research Center (CPRC) for funding the majority of the five-month project.

TABLE OF CONTENTS

EXECUTIVE SUMMARY I

ACKNOWLEDGEMENTS III

INTRODUCTION 1

METHODS 2

- INTERVIEWS 2
- FIELDWORK 2
- LITERATURE 5

RESULTS 6

- INTERVIEWS 6
- FISHING GEAR AND BAIT 6
- PRESENT LOCATIONS 7
- HISTORICAL LOCATIONS 9
- SEASONAL LOCATIONS 10
- SPAWNING AND REARING AREAS 12
- SIZES AND AGES 17
- ABUNDANCE 18

DISCUSSION 19

- FISHING GEAR AND BAIT 19
- HABITAT CRITERIA 19
- SPAWNING AND REARING AREAS 22
- SIZES AND AGES 23
- ABUNDANCE 24

CONCLUSIONS 25

RECOMMENDATIONS 27

REFERENCES 28

LIST OF FIGURES

Figure 1. Map of the Saskatchewan River System and important tributaries. 3

Figure 2. Present locations of frequent sturgeon occurrences in Saskatchewan. 4

Figure 3: The elevation of the North Saskatchewan River from Edmonton to Lake Winnipeg. 15

Figure 4. Potential areas of critical fish habitat in the South Saskatchewan River. 16

Figure 5. Areas for future fieldwork in Saskatchewan. 26

LIST OF TABLES

Table 1: Locations of frequent sturgeon occurrences in the South Saskatchewan River. 8

Table 2: Locations of frequent sturgeon occurrences in the North Saskatchewan River. 8

Table 3: Locations of frequent sturgeon occurrences in the Saskatchewan River. 9

Table 4. Historical locations for sturgeon in the South Saskatchewan River. 11

Table 5. Historical locations for sturgeon in the North Saskatchewan River. 11

Table 6. Historical locations for sturgeon in the Saskatchewan River. 11

Table 7. Spawning locations for sturgeon in the South Saskatchewan River. 14

Table 8. Spawning locations for sturgeon in the North Saskatchewan River. 14

Table 9. Spawning locations for sturgeon in the Saskatchewan River. 14

Table 10: Sturgeon habitat criteria and examples of locations found in Saskatchewan. 20

INTRODUCTION

The species *Acipenser fulvescens*, commonly known as lake sturgeon, is one of the largest and most ancient freshwater fish. They also have one of the largest geographic ranges of freshwater fish (Houston 1987). Their western range is limited to the North and South Saskatchewan Rivers in Alberta and some tributaries.

Concerns regarding recent lake sturgeon populations in Canada have been increasing among many of its residents and resource agencies. The federal committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the provincial Wildlife Species at Risk (WSAR) committee have lake sturgeon populations under review.

Agricultural settlement caused Saskatchewan's human population to increase from 91,000 in 1901 to 492,000 in 1911 and 921,000 in 1930 (Basavarajappa and Ram 2000). By the 1930's, serious changes in sturgeon numbers may have already occurred. For example, in the Maymont area of the North Saskatchewan River, an old ferry operator reported that "twenty or thirty years ago, sturgeon were frequently seen there but that none had been seen in recent years" (Reed 1959).

The primary objectives of this report were to:

- identify historical and present lake sturgeon locations in Saskatchewan
- obtain information on preferred fishing gear and seasons
- identify potential locations for spawning, rearing, feeding and over-wintering
- gather data on relative sizes and abundance
- research literature on habitat requirements and food preferences
- suggest locations in each river for future fieldwork
- chose a minimum of six sites with historical data for field work
- provide names for future contact regarding fieldwork and preserved specimens

METHODS

The study area consisted of the South, North and Saskatchewan rivers and a few tributaries (Figure 1). Most interviews and fieldwork were conducted along the South and North Saskatchewan rivers as far as Tobin Lake on the Saskatchewan River.

INTERVIEWS

Anecdotal evidence was gathered through personal and telephone interviews, and website questionnaires. Contact names were collected from past Saskatchewan Environment programs such as the sturgeon angler diaries (1989 to 1991) and sturgeon licenses and endorsements (1996 to 1998). Additional names were provided by Conservation Officers.

Conservation Officers, biologists, technicians, and instructors from Saskatchewan Environment, Alberta Sustainable Resource Development and SIAST (Woodland Campus, Prince Albert) provided expert information and help in many areas. An internet site "Sturgeon Spotters of Saskatchewan" was created to provide a questionnaire for anglers and information on the project (www.sturgeonspotters.com). The questions asked to most anglers pertained to sturgeon locations, sizes, abundance, seasons, and bait and gear (Appendix 1, printed separately).

FIELDWORK

Popular fishing holes where lake sturgeon have been caught or observed were visited and assessed for sturgeon habitat criteria. Many sites were located near locally familiar places such as near bridges and ferry crossings and were easily accessible from land. Conservation Officers from Leader, Saskatoon, Lloydminster, North Battleford and Prince Albert escorted me on field trips of their area and located relevant sites. Details on site positions (GPS coordinates and landmarks), substrates and vegetation located on or near the shoreline, and estimated velocity of current and depth were recorded. This information is intended to assist field crews in site location and provide general characteristics of the areas.

Most locations were easily accessible, however some required 4x4 truck or a boat to access and others were walk-in sites. The Saskatchewan River was explored twice by motorboat. The first was in June of 2002 downstream of Francois-Finley Dam, during sturgeon test-netting conducted by Lyle Wallin, Howard McKenzie, and Joe Fiddler. Secondly, in September of 2002 the section of river between Francois-Finely Dam and Tobin Lake was accessed with the motorboat of Dwayne Drake, an avid angler from Tisdale. With his help each location was assessed, mapped and depth measurements were taken with a depth finder.

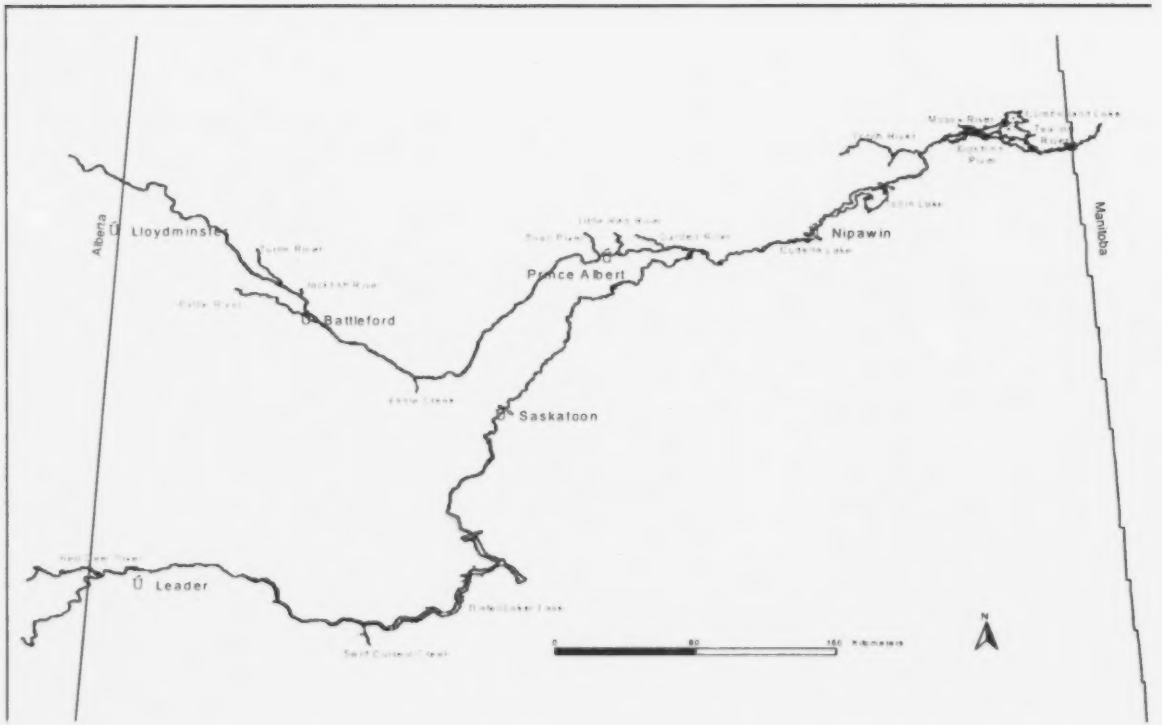

Figure 1. Map of the Saskatchewan River System and important tributaries.
Dams and weirs are indicated with red solid lines and green stars indicate cites and towns where the majority of the interviews occurred.

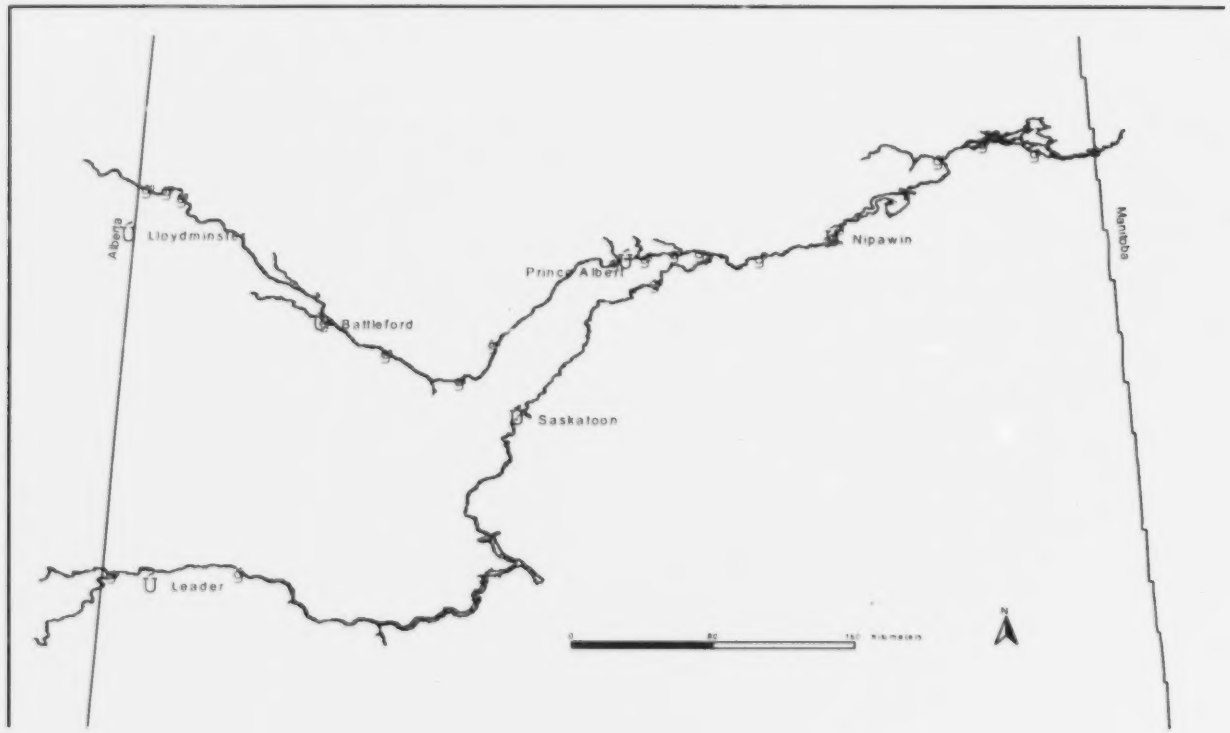

Figure 2. Present locations of frequent sturgeon occurrences in Saskatchewan. Map numbers referred to in text are shown.

Each location was mapped using GPS coordinates and ArcView GIS computer/mapping system. Hydrologic layers were added to base maps from NTS 1:50,000 for detailed maps in Appendix 2 (L. Koback pers. comm.; printed separately).

LITERATURE

Old explorer diaries, fisheries technical reports, and anecdotal information provided some historical data involving catch locations, numbers and sizes of lake sturgeon and past conditions of the river. Anything prior to 1970 was chosen for historical data. This period pre-dates changes in the river, such as the construction of the Gardiner Dam by 1967 and declines in sturgeon habitat and population in the lower Saskatchewan River near Cumberland House in the 1960's.

Literature of field surveys conducted in the South Saskatchewan River included Reed (1959), Royer (1972), Jensen and Chen (1986), and Miles and Sawchyn (1988). Literature from the North Saskatchewan River included Voligny (1917), Reed (1959), Tones (1970), and Merkowsky (1987). Those from the Saskatchewan River included Voligny (1917), Reed (1959), Royer (1966) and (1969), Royer et al. (1968), Durbin (1981), Wallace (1999). Few of these reports covered lake sturgeon specifically, but most commented on habitat for riverine species.

Explorer diaries including Samuel Hearne (1774-1775), Matthew Cocking (1776-1777), and Philip Turnor (1790-1792), David Thompson (1784-1812), and Alexander Henry (1760-1776) who described the conditions of the rivers and commented on lake sturgeon catches and sightings.

RESULTS

INTERVIEWS

More than 150 people were contacted for local anecdotal information. Several anglers contacted were over the age of eighty and have been fishing the river for decades. The youngest angler contacted was six years old and from The Pas, Manitoba. The earliest observation of sturgeon occurred in the Connell Creek (a tributary of the Carrot River) in the 1920's and the earliest catch was reported from the city of Prince Albert in the 1940's

Many anglers have been fishing the three Saskatchewan Rivers for decades and many concentrated on lake sturgeon when harvests were allowed, prior to 1999. Historically and up to about 10 years ago, sturgeon angling was a common family interest for the sport as well for the food. Today, anglers are still interested in the catch-and-release sport of sturgeon angling, however concentrating on the species is looked down upon. They are also very interested in the behavior and requirements of lake sturgeon and are concerned about their population numbers in Saskatchewan. The majority of the anglers contacted were more than happy to help with the project and provide detailed information.

FISHING GEAR AND BAIT

Walleye and pike rigs were the most common fishing gear used by Saskatchewan anglers when fishing the rivers. Lake sturgeon were caught on a variety of other gear including single hooks, jigs, treble hooks, bottom bouncers and spinners. Depending on the size of fish they hoped to catch, test lines were of varied strengths, however the landing time of the catch increased with lighter test line. The hooks needed to be close to the bottom, so depending on the strength of the current sinkers of one to six ounces were used.

The bait most commonly used by anglers were dead minnows, which subsequently caught the most sturgeon. Nightcrawlers or earthworms were the second most popular bait used. Other baits included leeches, beef heart or fat, any smelly meat, salmon heads, shrimp, crayfish and even a piece of red cloth. A taxidermist from Prince Albert, reported the contents of many sturgeon stomachs to be full of clams. Analysis of stomach found in the literature included a variety of insect larvae, clams, snails, crustaceans, nematodes, leeches, plants, fish and fish eggs (Harkness and Dymond 1961, Scott and Crossman 1973).

PRESENT LOCATIONS

There were a total of 107 sites known for sturgeon occurrences in Saskatchewan (Appendix 3, printed separately). Thirty sites are located in the South Saskatchewan River, with the majority located upriver from Lake Diefenbaker and 48 sites in the North Saskatchewan River. Thirty-three sites are located in the Saskatchewan River.

Of these 107 sites, about 45 had numerous reports of sturgeon occurrences each year. The South Saskatchewan River has 7 sites, the North Saskatchewan River has 16 sites and the Saskatchewan River has 12 sites. Potentially suitable habitat for sturgeon was observed in many of these areas.

The 7 sites for lake sturgeon in the South Saskatchewan River are located in the Leader area (maps 1 to 5, see Table 1). Miles & Sawchyn (1988) noted the portion of the South SK River between Alberta and Lake Diefenbaker to be ideal for lake sturgeon, and other fish species. Downstream of Lake Diefenbaker, no occurrences were reported until the city of Saskatoon. Few sturgeon were reported downstream of Saskatoon until the Muskoday Bridge (map 38). There are many ferries and access points downstream of Saskatoon where anglers are said to be common, but few sturgeon catches or observations have been reported so far.

There are many areas in the South Saskatchewan River with numerous shifting sandbars and low-lying flats, such as the Chesterfield flats area (map 2). The 100-km stretch of river below Gardiner Dam, is considered unsuitable for sturgeon because of lower temperatures and lack of prey. The habitat beyond this point is where effluents of sewage and industrial pollution from Saskatoon enter the river (Lehmkuhl 1972). The area between the Gardiner Dam and Saskatoon is sparse in diversity and abundance for all fish species. Sturgeon in particular, were noted to be widely excluded from this area

In the North Saskatchewan River, there are 16 sites commonly noted for sturgeon occurrences throughout the length of the river. (Table 2) Six are located in the Lloydminster area (maps 70 to 68). The Onion Lake Bridge and the site north of the Deer Creek Bridge produced significant catches of sturgeon between 1993 to 1996 during Alberta test-netting (D. Watters unpubl. data). Two sites were commonly noted for sturgeon in the Battleford area (map 59), and four in the Prince Albert area (maps 44 to 41). Merkowsky (1988) reportedly caught five sturgeon in gill nets at Cecil Ferry in 1986. Other sites are distributed between Battleford and Prince Albert (maps 56 to 51).

Table 1: Locations of frequent sturgeon occurrences in the South Saskatchewan River.

Site Name	Site ID#	Location	Comments
Meier's	1-H	Angling off SE bank. Few miles from the SK/AB border. Includes the area between this site and 1-G.	Deep with large boulders. Good for larger sizes.
Meridian Dam Site	1-G	Angling off NE bank. The proposed Meridian Dam site.	Filled with massive boulders the size of cars. Good for larger sizes.
Hutterite Pump Site	1-D	Junction of the Red Deer river. This site and 1-C are also known as Bull's Forehead.	Rocks and gravel beds are present.
Lebenthal Point	1-C	Angling off east bank most common.	Deep holes in the area near sand bars. Once was popular site for Alberta anglers.
Elsie's Cove	1-E	Angling off south bank.	There is a deep hole here about 80 feet wide when water is low. Rocky but more sandy to the east.
Lancer Ferry	5-B&C	Angling off north and south bank, west of ferry landing.	Lots of sandbars west of the ferry. Once was popular site for Alberta anglers.
Muskoday Bridge	38-A	Angling off west bank south of the bridge. Sturgeon seen in the water while looking down from bridge.	Lots of sandbars in the area.

Table 2: Locations of frequent sturgeon occurrences in the North Saskatchewan River.

Site Name	Site ID#	Location	Comments
Onion Lake Bridge	70-C	Highway #17 at the SK/AB border.	AB test-netting was very successful.
Old Onion Lake Ferry	70-A&B	Angling off north and south banks.	Submerged sandbars with eddies.
Old Frenchman Butte Ferry	69-A	North bank	Eddies noted and deep channel to the west.
N. of Deer Creek Bridge	68-E	North 1 km from bridge.	AB test-netting and angling from boat.
Deer Creek Bridge	68-D	Angling off west bank, under bridge	Eddies present
Old Deer Creek Ferry	68-B	Angling off south bank.	Back eddies and small rapids noted. Deep hole about 16 ft.
Highway 16 Bridge	59-H	Angling off west bank between the new bridges.	Deep hole about 26 ft.
Finlayson Island	59-A	Angling off east bank off island.	Large eddies here.
Old Maymont Ferry	56-B&C	Angling off north and south banks.	Rapids, deep eddies and sand bars. Larger sizes here and common area for poachers.
Borden Bridge	54-A&B	Angling off both banks east of bridge.	North bank with deep channel and south bank with eddies. Common area for poachers.
Petrofka Bridge	51-A&B	Angling off both banks to the east of the bridge near old ferry crossing.	Larger sturgeon here.
Shell River	44-A	Angling at mouth of shell river off north bank.	Deep hole here. Historically called the Sturgeon River.
P.A. Airport	43-C	Angling off both banks.	Large shoreline with many boulders.
Cecil Ferry Crossing	42-A	Angling south bank	Deep hole 10-30 feet from shore.
La Colle Falls	41-A	Angling off both banks, both above and below falls.	Set of rapids across river. Historical location, possible spawning and over-wintering area.
The Forks	41-C	Point where N & S SK Rivers meet.	Deep hole with eddies. Larger sturgeon.

Table 3: Locations of frequent sturgeon occurrences in the Saskatchewan River.

Site Name	Site ID#	Location	Comments
Hwy #6 West	C-1	2 km meters west of bridge. Angling off islands south bank and near mouth of creek.	Deep hole at upstream island tip.
Net #1	E-1	In cove on east bank, right below dam.	SK test-netting here. Back eddies present.
Net #2	E-2	East bank, right below dam.	SK test-netting here. Back eddies present.
Net #3	E3	West bank, right below dam. Many boulders near shore.	SK test-netting here. Saw a large fish sitting on the bottom with depth finder.
Net #4	E4	In cove on west bank.	SK test-netting here. Weeds with sand and gravel in area to the north.
End of 2nd drift	F-5	Angling along west bank	All throughout the river bend.
White rock run	F-6	Along east bank down to houseboats.	All throughout the river bend. Hole in area about 16-18 ft deep. Possible clam bed in the area.
Eagles Nest	F-8	Angling near east bank in front of sign.	Deep hole 9-23 feet. Below an actual eagles nest.
Torch River	M	Tributary into the New Channel of the Saskatchewan River.	Larger sizes at spawning time near the junction.
Center Angling River	N	Part of new channel.	Particularly good for sturgeon here.
Mossy River	O & Q	Tributary of Cumberland Lake.	Particularly at the rivers mouth and above it in "Windy Lake".
Bigstone Rapids	R	Below Bigstone Cutoff at the SW of Cumberland Lake.	Rapids across width of river. Fast and deep water with large boulders.

There are 12 sites known for frequent sturgeon occurrences in the Saskatchewan River (Table 3). Only one site is located upstream of the Francois-Finley dam (C-1). The rest are located downstream and are illustrated between maps E and T. In June of 2002, test-netting caught 45 sturgeon for tagging (L. Wallin, pers. comm.). In two days, the crew caught 14 sturgeon at site E-2 and 11 at site E-4 and in three days he caught 26 sturgeon at site E-3. Twenty-four were females and twenty-one were males.

HISTORICAL LOCATIONS

Numerous locations were reported for sturgeon catches and observations prior to 1970. In the South Saskatchewan River there were 3 historical sites noted for sturgeon. There were 9 in the North Saskatchewan River and 13 in the Saskatchewan River.

In the South Saskatchewan River, many of the historical locations occurred in upstream areas (map 1 to 5, see Table 4). Reed (1957) quoted an informant reporting the Hutterite pump site, near the mouth of the Red Deer River, to be where "considerable numbers" of sturgeon occurred and many were caught by set-lines each year. In 1961, M. Atton (DNR) also witnessed sturgeon here (Harkness 1961). The sites within the area known as the "Chesterfield flats" (map 2) and the remaining sites have been identified as historical locations from anecdotal evidence.

Historical locations for sturgeon in the North Saskatchewan River (Table 5), include two sites in the Battle River, one at the Rapids and the other at the Old Tressel. The later site was historically called "The Dam" where fishing traps were located in the 1960's. In the Maymont area, an old ferry operator reported that "twenty or thirty years ago sturgeon were frequently seen there but that none had been seen in recent years" (Reed 1959). The explorer Matthew Cocking reported 165 sturgeon were caught throughout the winter of 1775/76 in the Sturgeon River (Barka and Barka 1976), presently known as the Shell River.

Historical locations or catches of sturgeon on the Saskatchewan River were noted in several accounts from the late 1700s to the mid-1900s (Table 6). In the Horseshoe Bend area, the ground was reported by an angler to be littered with "sturgeon bones" in the 1960's. Henry Hind, an explorer in 1858, commented on the numbers of sturgeon in the Fort-a-la-Corne, where E. Reed reported a domestic gill-net fishery here in 1959. The Torch River, (historically the Little Sturgeon River), was noted for sturgeon by explorer Matthew Cocking in 1772. Philip Turnor, in 1790, reported catching 151 sturgeon in Cumberland Lake from late June to September and caught 18 on September 2, 1970. Henry Hind in 1858, also mentions sturgeon abundance near Cumberland Lake, Big Stone Creek and the Tearing River. He also reported sturgeon to be one of the main items for food and export in the areas. Many of these channels have changed after ice jams occurred around 1873. Lastly, Pasquia River (or Basquiau River), a tributary of the Red River, was noted for sturgeon in 1774 by explorer Samuel Hearne.

SEASONAL LOCATIONS

Anglers noted frequent catches in all seasons, from spring to fall. The summer season included the majority of reports, and spring and fall were relatively equal in numbers. However, some locations were relatively seasonal for sturgeon occurrences. One avid angler from Saskatoon reported sturgeon caught in the spring and fall to be "weaker fighters" as compared to those caught in the summer.

Table 4. Historical locations for sturgeon in the South Saskatchewan River.

Site Name	Site ID#	Location	Comments
Meier's	1-H	Angling off SE bank. Few miles from the SK/AB border	Deep with large boulders. Good for larger sizes.
Meridian	1-G	Angling off NE bank. The proposed Meridian Dam site.	Filled with massive boulders the size of cars. Good for larger sizes.
Bull's forehead	1-D&C	Where Red Deer River enters	Historically good for larger sizes
Chesterfield Flats	Map 2	The sites within this area include those between 2-A & 2-H	Numerous sandbars in the area Old Chesterfield House from 1800-1805
Saskatoon weir	29-A	East bank; below weir	Good for larger sizes.

Table 5. Historical locations for sturgeon in the North Saskatchewan River.

Site Name	Site ID#	Location	Comments
The Rapids	59-F	About 1km upstream in Battle River	Old fish trap site.
The Old Tressel	59-G	About 2kms upstream in Battle River	Historically good for larger sturgeon
Old Maymont Ferry	56-B&C	East of the Maymont Bridge	Numerous in the 1930-40's.
Eagle Creek	55-B	Mouth of Eagle creek off south bank	Good up to 3 years ago. Old Fort here.
Shell River	44-A	Mouth of Shell river off North Bank	Three "Sturgeon" Forts in area from 1776-1805.
6th Ave in PA	43-F	At the foot of this street on south bank.	This site was not visited.
Cecil Ferry	42-A	Angling off south bank; east of the ferry	5 caught here in reeds 1958?
La Colle Falls	41-A	Both banks ; above and below rapids	Possible historically over-wintering area
The Forks	41-C	Confluence of the N & S SK Rivers	Larger sizes caught and sighted here

Table 6. Historical locations for sturgeon in the Saskatchewan River.

Site Name	Site ID#	Location	Comments
Horseshoe Bend area	A-1	Where the river winds numerous times in the upstream portion.	Metis people in area historically.
Fort-a-la-Corne	B-1	Downstream of Horseshoe Bend.	Old fort in 1753-57 & 1846-1932.
Torch River	M		Historically called the Little Sturgeon River.
Mossy River	O & Q	Tributary of Cumberland Lake.	Commercial and subsistence fishing.
Cumberland Lake	P & Q	Downstream in the new channel.	Sturgeon noted as prevalent here as upstream in the Saskatchewan River.
Oldman Island	P	SW corner of Cumberland Lake above Bigstone Cutoff.	Traditional fishing site for elders.
Big Stone Creek	R	Tributary of Cumberland Lake which joins the new channel.	Henry Hind called it a creek.
Bigstone Rapids	R	SW of Cumberland Lake, below Bigstone Cutoff.	Commercial and subsistence fishing site also called Sask. River Rapids.
Tearing River	R & S	Near outlet of Cumberland Lake & outlet of river into Sask River	Elders report spawning decades ago. Commercial and subsistence fishing.
Pasquia River	...	Near SK/MB border tributary of Red River.	Historically called Basquiau River.
Connell Creek	...	Tributary of the Carrot River.	Possible historical spawning site in 1920's.

Summer locations noted for sturgeon included Elsie's Cove, Meier's, Bull's Forehead, Muskoday Bridge, Petrofka Bridge and The Forks. Locations for the spring and fall seasons include Bulls Forehead, Meier's and Meridian sites in the South Saskatchewan River, and Onion Lake Bridge, the old Maymont ferry, Borden Bridge, Petrofka Bridge, and Cecil Ferry in the North Saskatchewan. River. The Onion Lake Bridge was the most popular site for sturgeon in the autumns of 1994 to 1996 during sturgeon surveys (Watters unpubl. data). Popular spring locations in the Saskatchewan River include Nets 1 to 4 from SE test-netting.

In winter, smaller sturgeon were reportedly caught in the South Saskatchewan River at the mouth of the Red Deer River (map 1), at Lemsford Ferry (4-C) and Clarkboro Ferry (30-B). In the North Saskatchewan River ice-fishing catches occurred at Borden Bridge. Historically in Cumberland Lake, sturgeon were caught in the winter however, fishing as proved to be difficult in recent decades.

SPAWNING AND REARING AREAS

Spawning

Spawning areas for sturgeon include areas of fast flowing rapids with rock or cobble substrate. Eggs are scattered by the current and adhere to rocks and logs downstream (LaHaye et al. 1992). Spawning occurs during temperatures of 12 to 15°C, which occurs late May into mid June in the Saskatchewan River system.

In the South Saskatchewan River there are four potential spawning sites, four in the North Saskatchewan River and six in the Saskatchewan River.

Alberta's portion of the South Saskatchewan River has 10 potential spawning sites. Two major sites include the Grand Forks (confluences of the Oldman and Bow River tributaries) and Miner's Flats, which has suitable rapids and cobblestone substrates for spawning (Radford 1980, RL&L 1991). Spawning migrations of radio-tagged sturgeon to the Miner's Flats area occurred between May 23rd and June 17th in 1986 (RL&L 1991). In the South Saskatchewan, the Bulls Forehead area (sites 1-C and 1-D) where the Red Deer River enters the South Saskatchewan contains rock and gravel beds potentially suitable for spawning (K. Fitzsimmonds pers. comm) (Table 7). Potentially suitable rapids are found within 100 feet downstream of 5 ferry locations from Clarkboro Ferry to Weldon Ferry. However no spawning observations have been reported. These rapids were created from dredging to improve water depths at the crossing sites (J. Merkowsky pers. comm.).

In the North Saskatchewan, four sites were specifically noted for potential spawning (Table 8). The old Maymont Ferry crossing is one where large amounts of sturgeon were seen swimming upstream and visibly rolling and jumping 3 to 4 feet in the air. The two anglers who reported this both said "there were so many of them, one could almost walk on water". Merkowsky (1987) reported potential sturgeon spawning areas upstream of Cecil Ferry (42-A) to the Forks (41-C). One of these spawning areas likely includes the La Colle Falls (41-A).

Historical locations noted for potential spawning in the North Saskatchewan River include sites located in the Battle River at the Rapids, where a man in 1965 reportedly shot a large female sturgeon and filled a few tubs with eggs. Smaller rapids were located at the old Deer Creek Ferry crossing (68-B), Hwy 21 bridge (66-A), and the Old Dam (41-B). Merkowsky (1987) noted the Garden River (42-B) to possess high water levels, rapid flow and rocky substrate. She also noted the principal creeks in the North Saskatchewan River, were the Battle and Turtle Rivers, Jackfish and Eagle Creeks, and the Shell River.

Four locations are considered to be potential areas for lake sturgeon spawning in the Saskatchewan. At least two potential locations are located above EBCampbell Dam and four occur downstream (Table 9). Below the dam, the lower Saskatchewan River is generally low-gradient, so areas with rapids tend to be localized, such as Bigstone Rapids. Spawning in the Torch River was suggested in 1978 and confirmed in June 1996 by the capture of sturgeon fry (Willard et al. 1978, Wallace 1999). Shoreline spawning has been observed along river edges and in lakes on shores of islands in a few Wisconsin rivers (R. Bruch pers. comm.) and in the Cumberland Lake area by (J. Carriere pers. comm.). Presently rapids are located at Fort-a-la-Corne Rapids (map B), at site C-1 and F-16. No accounts of spawning have been reported at these sites so far.

Historically, rapids along the Saskatchewan River were numerous in some areas, and if they are still present today, they may be potential spawning sites. A survey in 1910-1915, on the North Saskatchewan River showed a gentle decline for 500 miles from Edmonton to La Colle Falls (Voligny 1917). The next stretch drops 450 feet in 175 miles: La Colle falls (14 short rapids falling 88 feet in 13 miles), the smaller Cadotte and Nipawin Rapids (falling 20 feet total), and ending with Tobin and Iskwao Rapids (falling 27 feet total). These were the last set of rapids for 300 miles until Grand Rapids, MB (Figure 3). Reed (1958) reported short stretches of rapids made of small bars of cobblestones in the area between Nipawin and Cumberland House.

In the 1920's, Connell Creek (tributary of the Carrot River), was noted by a local farmer for large amounts of congregating sturgeon. They were so numerous that it was almost as if one could walk on water. The river reportedly flowed freely at this time.

Table 7. Spawning locations for sturgeon in the South Saskatchewan River.

Site Name	Site ID#	Location	Comments
Meier's	1-H	Area between these two sites.	...
Meridian	1-G		
Hutterite Pump site	1-D	Confluence of the Red Deer River	...
Lebanthal point	1-C	...	Gravelly substrate

Table 8. Spawning locations for sturgeon in the North Saskatchewan River.

Site Name	Site ID#	Location	Comments
The Rapids	59-F	In the Battle River	Set of rapids upstream.
Old Maymont Ferry	56-B&C	North and south banks	Rapids, deep eddies and slower pools in area
P.A. Airport	43-C	Angling off both banks.	Large shoreline with many boulders.
La Colle Falls	41-A	Both banks.	Large set of rapids across the river

Table 9. Spawning locations for sturgeon in the Saskatchewan River.

Site Name	Site ID#	Location	Comments
Torch River	M	5 km upstream of outlet.	Sturgeon fry caught in 1996.
Missipuskiow River	...	Tributary to the Torch River.	Elders reported lots of sturgeon in the spring.
Mossy River	O	Tributary of Cumberland Lake.	Possible spawning area (Wallace 1991).
Cumberland Lake	Q	Islands in the north end	Elders report small sturgeon.
Bigstone Rapids	R	Below Bigstone Cutoff.	Ripe females seen in June 1996 and 2000

Rearing

Sturgeon fry live off their yolk sac for a week before drifting downstream into quiet-water habitats. They tend to prefer habitat with flat bottoms composed of pea-sized gravel and coarse sand (Kempinger 1996, Peake 1999). In the South Saskatchewan River, rearing areas in Alberta are suspected between the Grand Forks and Rattlesnake Hole. In Saskatchewan, potential exists in the lower reaches near the Sandy Point Bridge and near the mouth of the Red Deer River (RL&L 1991). In Saskatchewan, rearing areas for all riverine fish species were noted between Lebenthal Point (1-C) and the old Estuary Ferry crossing (1-A). Included were areas near the north and south tips of Yorath Island (22-B), downstream of Clarkboro Ferry (30-A) and Fenton Ferry (38-B) (Miles and Sawchyn 1988; Figure 4 & 5).

Few rearing areas for sturgeon in the North Saskatchewan River were noted. Juveniles as small as 0.7 kg were captured at the Onion Lake Bridge and Deer Creek Bridge (D. Watters unpubl. data). In the Saskatchewan River, three locations were considered to be potential rearing areas. In the lower Cumberland Lake area, potential nursery areas were reported around river mouths and islands and in the Tearing River (Wallace 1999).

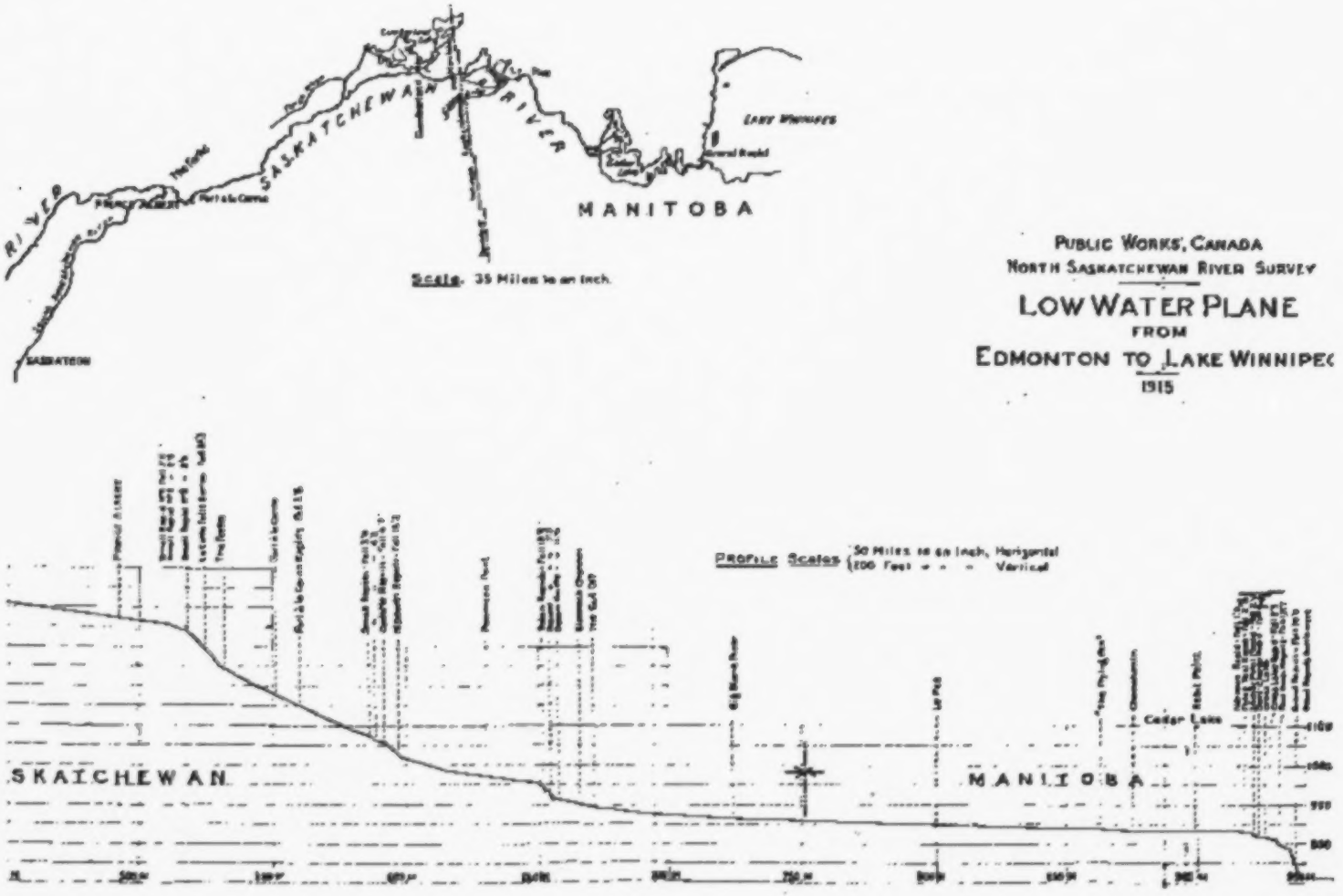

Figure 3: The elevation of the North Saskatchewan River from Edmonton to Lake Winnipeg. Portion of original map by Voligny (1917).

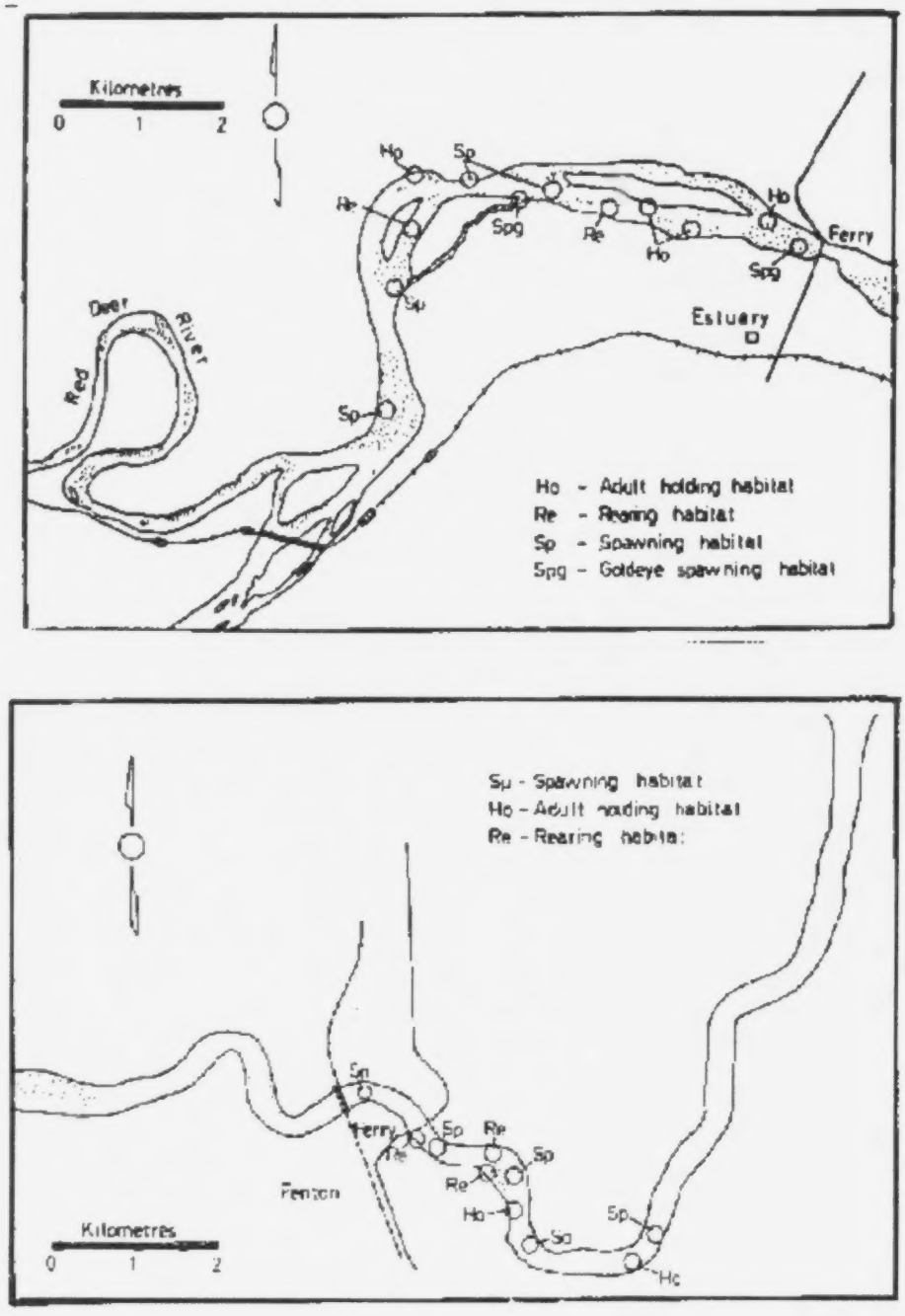

Figure 4. Potential areas of critical fish habitat in the South Saskatchewan River. Top panel is Estuary Ferry and bottom panel is Fenton Ferry (Miles and Sawchyn 1988).

SIZES AND AGES

Anglers reported sizes in most of the 150 interviews but this information covered all areas and decades. About half of the sizes were estimated and half were actually weighed.

The most common sizes reported by anglers recently are in the 5 to 25 pound range, and the largest sizes were 30 to 40 pounds. Saskatchewan anglers reported the average size of 106 sturgeon kept in 1996, were 105 cm (approximately 30 lbs) (Howard 1996). Anglers catch a wide range of sizes the smallest reported from the South Saskatchewan River at 0.2 pound. Maximum catch sizes of 230 pounds and sighting of sturgeon over 14 feet long have been reported after 1970.

In the South Saskatchewan River, sizes of 60 pounds and up occur at Meier's, Meridian, Elsie's, Bulls Forehead, Estuary Ferry, and the Muskoday bridge. In the North Saskatchewan River, sturgeon over 60 pounds occurred at the old Onion Lake Ferry, Finlayson Island, old Maymont ferry, Borden bridge, Petrofka Bridge, the P.A. Airport, Cecil ferry and the Forks. Larger sizes are thought to frequent areas with warm water effluents (H. Greenwood pers. comm.). In the Saskatchewan River, test-nets and set-lines caught sturgeon from 5 to 45 pounds in size with maximum of 72 pounds from 1996 to 2002 (L. Wallin pers. comm.) Sizes between 70 and 100 pounds have been reported in all Saskatchewan Rivers both presently and historically.

In 1885 the average weight in Saskatchewan was 12 to 70 pounds, 31 to 48 pounds in Alberta, and 15 to 44 pounds in Manitoba (COSEWIC 1986). Anglers reported 50 to 60 pound sturgeon are not as common today as they were historically. Explorers of the 1700 and 1800's did not frequently mention sizes. However, Matthew Cocking in 1776 caught 165 sturgeon throughout the winter and sizes ranged from 3 to 40 pounds with most between 16 and 24 pounds (Barka and Barka 1976). David Thompson noted the sizes netted near Cumberland Lake ranged from 15 to 50 pounds (Friesen 2001). The largest historical size reported by an angler was 260 pounds from the South Saskatchewan River in 1961. Historical anecdotes say sizes of 40 to 50 pounds were common 10 to 15 years ago. Most information on sizes was estimated and anecdotal therefore no size compositions can be reported.

Ages were not available from observations in Saskatchewan, so growth rates and mortality rates cannot be shown. Several surveys in the Saskatchewan River show the following sizes and approximate ages:

Weight (pounds)	Fork-length (inches)	Ages (years)
10	31 to 38	16 to 20
30	44 to 53	24 to 35 (or more)
50	51 to 62	32 to 62 (or more)

(generalized from data in Royer et. al. 1968 and ASRD 2002).

Ten preserved specimens were mentioned during interviews (for potential genetic work) with leads on a few others. Experts say a minimum of 50 specimens is needed for each spawning site for reliability (Robinson and Ferguson 2001).

ABUNDANCE

The sub-populations in the South and North Saskatchewan Rivers in Alberta are considered to be at or below the critical densities needed to sustain their populations (ASRD 2002). In the South Saskatchewan River, according to mark-recapture data and angler surveys, Alberta's population density is extremely low and recent trends indicate no substantial increase (RL&L 1991). ASRD (2002) estimated the South Saskatchewan River population to be 2058 fish (> 3 yrs) within a 300 km stretch or river. In 1986 there were an estimated 510 potential spawners (RL&L 1991). If sex ratios were equal and spawning intervals were 4 to 7 years, potentially only 36 to 63 females would spawn each year.

In the North Saskatchewan River, ASRD (2002) estimated the population in 2000 at 190 mature individuals. Again, using equal sex ratios and spawning intervals of 4 to 7 years, the number of mature females could be as low as 14 to 25 females. The density of the North Saskatchewan River was reported to be extremely low at 2.5 fish/km of river.

In the lower Saskatchewan River, from mark-recapture data, abundance was estimated at 1,300 medium and large sturgeons (over 18 pounds) in 1996 to 2001. There may be about 318 mature females and only about 64 females spawning each year, using equal sex ratios and known spawning every five years (R. Wallace pers. comm). Smaller sturgeon have not been marked in sufficient numbers for reliable estimates of this population. Historical abundance in the lower Saskatchewan River (below Tobin Lake) was 10,000 to 16,000 medium and large sturgeon about 1960 (Wallace 1991). This was based on observed mortality rate, known commercial harvests, and assumed natural mortality rates.

Relative abundance can also be estimated using catch-per-unit-effort (CPUE). Annual sturgeon fishing questionnaires on the South Saskatchewan showed a CPUE lower than reports from volunteer research anglers in the North Saskatchewan River (ASRD 2002). Lower catch rates in the South Saskatchewan suggest a smaller population than that in the North Saskatchewan River. Annual harvest results in the South Saskatchewan, over the past 10 years, ranged from 3 to 254 fish (Clayton 2001).

A rough estimate of abundance could use the average population density of sturgeon populations multiplied by the available habitat in Saskatchewan. In the lower Saskatchewan River, this method suggested about 5,000 medium and large sturgeons about 1960 (Wallace 1991).

DISCUSSION

FISHING GEAR AND BAIT

For angling, strong sturdy gear is the main component needed in order to withstand the enormous weights lake sturgeon can attain. Their habit of jumping out of the water, prolonged fighting and breaking fishing lines are why this type of gear is preferred.

The best bait for catching sturgeon as reported by many anglers, was any type of fresh, smelly meat. Sturgeon are very sensitive and may reject unnatural smells like rotten meat, when fresh food is available. While sturgeon are bottom feeders they prefer fresh baits and are very tuned in on native food sources (Hull 2003).

For test-netting, gill nets with 6 to 12 inch mesh or baited hook-lines prove to be successful in catching sturgeon in the 10 to 50 pound size range. Electrofishing and seining have been used to capture immature sturgeon with varying success. Mortality caused by nets or hooks is quite low, but electrofishing is a concern for juveniles.

HABITAT CRITERIA

The majority of the 45 locations commonly noted for sturgeon possess one or more characteristics for suitable sturgeon habitat as found in the literature. Characteristics include areas along river bends, near the upstream tip of larger islands and sandbars, near mouths of larger rivers and rapids, and sections in lakes near ledges and drop-offs. In most of these areas eddies are present and Alexander Henry in 1775, said sturgeon tend to rest behind them (V. Friesen 2001). Locations where sturgeon have been frequently caught or observed were noted for many of these characteristics (Table 10). Often more than one characteristic was found at each site.

As adults, lake sturgeon often congregate in deep, slow-velocity pools with silt/rock substrate located in the thalweg (the line defining the deepest points along a channel)(Haugen 1969). These locations provide suitable habitat for over-wintering and for cover during the summer (McLeod et. al. 1999).

Depth

Lake sturgeon are shallow water fish preferring depths of two to six meters, however they have been caught at depths over 42 meters (Seyler 1997). The depth of all three Saskatchewan Rivers is generally shallow usually measuring 6 to 10 feet, with deeper holes of 15 to 50 feet scattered throughout. An avid angler in the Lloydminster area noted sturgeon caught during the day were at a depth of about 40 feet, where as in the evening and early morning, they were usually caught between 8 and 10 feet deep.

Table 10. Sturgeon habitat criteria and examples of locations found in Saskatchewan.

Habitat Characteristic	Site Number	Site Name
Bend in river	1-H, 1-G, 1-C&D, 2-A, 69-A, 41-A, A-1	Meier's, Meridian, Bulls Forehead, Car's Point, Frenchman Butte, La Colle Falls, Horseshoe Bend
Slow velocity pools or back eddies with swirling water	1-E, 59-H, 59-A, 56-A&B, 41-C, E-3, E-4	Elsie's Cove, Hwy #16, Finlayson Island, Old Maymont Ferry, the Forks, Net#3, Net #4
Deep holes near the upstream tip of larger islands or sand bars	1-C, C-1 and 53-D	Lebenthal Point, Hwy #6, Ken's Cove
Deeper holes near mouth of rivers or creeks	1-D, 2-A, 59-E, 55-B, 44-A, 41-C	Red Deer River, Cars Creek, Battle River, Eagle Creek, Shell River, the Forks
Narrow ("bottleneck") sections of river	1-A&B, 5-A,B&C,70-A&B, 68-E, 54-A&B, 56-B&C, and 51-A&B	Old Estuary ferry, Lancer Ferry, old Onion Lake Ferry, N. of Deer Creek Bridge, old Maymont Ferry, Borden Bridge

Sturgeon abundance increases where a range of depths is available, such as areas with sand bars and rapids (Ecologistics 1987). Sturgeon generally tend to concentrate in small numbers of holes in slow velocity pools or back eddies along the length of the river (Dumont et al. 1987, D. Watters unpubl. data.).

Temperature

In the summer especially, temperature is considered the guiding factor for habitat use. McKinley and Power (1991) report a decrease in movements as water temperatures reach 19°C. Sturgeon are generally not found in areas higher than 23°C (Ono et al. 1983). Young are found to tolerate higher temperature than mature ones (Beaulieu & Corbeil 1964). Sturgeon were noted to be more dormant in late fall and winter when temperatures drop (RL&L 1991, Endris 1990).

Velocity

Velocity is reported as a primary factor influencing habitat use (Seyler 1997). In the spring during non-spawning times, sturgeon prefer a velocity of 15 to 50 cm/s and are found along banks in back water areas where pools and shallows are most common (Haugen 1969, RL&L 1991). During higher flows of spring and summer, some fish may move out to other feeding or spawning areas (McLeod, et al. 1999). This may have been the reason for twice as many fish captured in gill nets after a flood during Merkowsky's 1987 study. River flows are typically at their lowest in the fall and sturgeon tend to distribute across all mesohabitats (Seyler 1997).

Substrate

Sand predominates in the South Saskatchewan River, interspersed with numerous areas of cobble and gravel or boulders. The substrate in Alberta is mainly gravel and turns to sand throughout most of Saskatchewan. The North Saskatchewan River is generally sandy with numerous shifting sandbars and low-lying flats distributed throughout, especially in the Maymont and Borden areas (Voligny 1917, Reed 1959). Downstream of the Forks, gravel and boulders are present and with numerous sandy areas located between Nipawin and Cumberland House (Ashmore 1986, Reed 1959). Interspersed in these sandy areas were shorter stretches of rapids made of small bars of cobblestones (Voligny 1917).

In the spring, preferred substrates tend to be laden with organic or coarse material such as gravel. Summer, they are caught more frequently near clay particles and less frequently near cobble/wood substrates. In fall they are found near clay and sand substrates as well as gravel (Chiasson et al. 1997).

The type of substrate seems to determine the abundance and type of prey available in the area. In both of the South and North Saskatchewan Rivers, field studies found mud/clay areas to be generally more productive than rock and gravel, and sandy bottoms were the least productive (Miles and Sawchyn 1988, Merkowsky 1987). In 1958, Reed noted rock and gravel bars as the most productive sites in both rivers, muddy areas in backwater and other slow velocity areas were second for bottom fauna production and sandy areas proved to be the least productive.

Food Supply

Sturgeon are generally opportunistic feeders and are not selective during food consumption, eating whatever prey are available (Beamesderfer and Farr 1997, Chiasson et al. 1997). They are well adapted for benthic feeding with a highly protrusible, suction-like mouth with olfactory and electroreceptors located on the snout and barbels. They use these adaptations for prey location and to navigate through their murky environment. Natural foods include insect larvae, clams, snails, leeches, freshwater shrimp, nematodes, fish and fish eggs, and plant debris (Harkness and Dymond 1961, Scott and Crossman 1973).

Many anglers reported catching sturgeon along the current's edge at numerous locations. Fast current near ledges, shelves and drop-offs creates an area where food can be funneled and deposited. The best places for food is where there is a "current edge" (where faster water meets the slower water) because these edges work like a rip current and tend to concentrate the food along the edge lines (Hull 2003).

Mayflies, caddis flies and stone flies were associated with stony and gravelly bottoms of rapidly flowing riffles where as tubifex worms and chironomids were associated with muddy bottoms (Merkowsky 1988, Reed 1958).

In the South Saskatchewan River, Miles and Sawchyn (1988) found the largest diversity of invertebrates in the section of river between Saskatoon and Clarkboro Ferry (maps 28-30). Tubifex worms comprised the largest number of benthic fauna sampled and were most abundant at Clarkboro Ferry, where only a few accounts of sturgeon were reported. Mayflies and caddis flies were most abundant at Fenton Ferry (map 38). Upstream of Fenton ferry near the Muskoday Bridge is where most catches occurred in this area.

In the North Saskatchewan River, Merkowsky (1987), found tubifex worms and chironomids in at least 90% of the benthic fauna sampled. They were found predominantly in mud and clay substrates in the areas of the Onion Lake Ferry and Petrofka bridge (Merkowsky 1987), two areas presently noted for lake sturgeon. Mayflies were the next most dominant group and were predominantly found in rocky/gravelly areas such as at Cecil Ferry, another common location for lake sturgeon. Reed (1958) noted the heaviest concentration of bottom faunas for both rivers, was in the North Saskatchewan at Frenchman Butte, a site commonly noted for sturgeon today.

In the lower Saskatchewan River, prey density was high in clay or weedy areas and highest in downstream, mainstream, and side-channel areas (typically shallow, with clay bottoms and warmer water). Prey density was very low in sandy areas, such as below BE Campbell dam (Wallace 1999).

SPAWNING AND REARING AREAS

Spawning

Spawning sites were selected for their physical characteristics, and whether lake sturgeon were observed in spawning behavior. This includes groups of 2 or 3 males following a large female as well as many leaping and rolling. Common criteria for spawning areas include deep holes near sections of rapids or rock reef areas. Rocky areas below dams were noted as possible spawning habitats as sturgeon are known to migrate long distances upstream for spawning (Harkness and Dymond 1961).

In the South Saskatchewan, spawning sites are very limited with only a few potential sites around Leader. Most known spawning sites are located upstream in Alberta. Both the North Saskatchewan River and the upper Saskatchewan River proper have numerous rapids located throughout their entire lengths, however very few observations of spawning behavior were reported. The upper portions of the Saskatchewan River have a much steeper gradient than downstream (Voligny 1917). In the lower Saskatchewan River, the only known spawning sites are located in Saskatchewan and few to none are located in Manitoba, according to biologists (D. Leroux and R. Fudge, pers. comm.).

Trans-boundary movements for spawning and over-wintering, were identified in both the South and North Saskatchewan Rivers. Upstream movements of 210 and downstream movements of 203 km were gathered from radio-tagged fish (RL&L 1991). Upstream

movements of 400 km and downstream movements over 500 km were calculated from tag returns in the North Saskatchewan River (D. Watters unpubl. data).

Similar movements occur in the Saskatchewan River between Saskatchewan and Manitoba. Most mature sturgeon radio-tagged near spawning sites moved downstream after spawning. Longest observed movements by individuals were 74 kilometers upstream and 89 kilometers downstream over a two-year period. Immature-sized sturgeon tagged in Manitoba reportedly swam some distance upstream after tagging and remained there (Wallace and Leroux 1999).

Lake sturgeon are generally sedentary in nature with localized movements related with feeding and over-wintering (ASRD 2002). There were long periods of up to 2 years of little or no movement during mid-summer and over-winter (Wallace & Leroux, 1999).

Rearing

Typical rearing areas for fry include flat sandy areas with drifting prey and minimal vegetation. Often they are found in shoals near the mouth of rivers (Scott and Crossman 1979). At night they are found near the surface and during the day, closer to the bottom (Kempinger 1983). Fry have been noted to drift up to 50 km below the spawning site to areas of lower gradients

One study has suggested sturgeon fry may need 250 kg/ha or more of prey density for easy searching and maximum rations. Prey of 20 kg/ha (or less) in sandy areas may limit survival, since constant searching does not provide "maintenance" rations (Wallace 1999).

Young sturgeon feed primarily on drifting insects associated with clean water (Kempinger 1996). Juveniles prefer mud/clay areas further downstream with higher prey densities.

SIZES AND AGES

There is not enough historical information to determine sizes at specific locations or to compare them with present sizes. Only two or three diaries of about 15 examined so far reported the sizes of any fish. Furthermore, changes in sizes may have occurred as early as 1910.

Present-day size structures might be estimated using diaries, recent angler surveys (Howard 1996), and possibly trophy records. These may provide enough data, but would certainly take time to find. At least 25 to 50 sizes in each area and decade would be required. Some reported weights and estimated ages may seem reasonable for a population with low mortality rates, but highly unlikely for one with high mortality rates. For example, ages 50 and older comprise 25% of mature sturgeon if mortality is 5%, but only 2% if mortality is 15% (R. Wallace pers. comm).

ABUNDANCE

Several approaches can be used to determine population abundance of lake sturgeon in Saskatchewan. Using the mark-recapture method, actual abundance can be found if enough tags are deployed and cover the population range (such as the section between Saskatchewan Landing and the Alberta border). If possible, tagging should be conducted over a short period so mortality and movements in and out of the area are negligible. The sturgeon can be caught by angling or test-netting, as long as catches are random or fish mix themselves within the area.

Mark-recapture studies of sturgeon are usually more reliable with year-to-year markings for a minimum of 5 years. Staff from the Fish and Wildlife Division of Alberta and volunteer anglers tagged lake sturgeon at various locations on the North Sask River from 1990 to 2001 (Watters 1993a, Watters 1993b). In the South Saskatchewan River, a population study ran during the summers of 1985, 1986 and 1987 (RL&L 1991). In the Saskatchewan River, a mark-recapture study started in 1996 by cooperative efforts of Saskatchewan Environment and Manitoba Conservation (Wallace and Leroux 1999) and is on-going.

The second approach uses catch-per-effort values to show trends in relative abundance or differences between populations or decades. This assumes that angling skills do not change, river conditions do not vary widely and have no long-term trends of their own. Since sturgeon move around seasonally, surveys should try to match locations and seasons from earlier data or from year to year. For example, high numbers of sturgeon are typically caught in May at areas with falls and rapids (McKinley et al. 1998) and in mid-summer, sturgeon can be found in calm, deep holes.

CONCLUSIONS

Populations can be assessed as healthy if they meet three essential criteria. First, suitable habitats should be available for all life stages. Secondly, size and age compositions should show reasonable proportions of immature, mature, and old fish. Thirdly, the present density or abundance should be compared to historical data (Holey et al. 2000)

Suitable habitats for all life stages must be present and there should be as much habitat for them today as there was in historical times (if some is inaccessible similar amounts should be provided). This would include spawning, nursery and adult habitats.

In stream or river populations, 70 year-old females and 40 year-old males should be present. Annual recruitment is not needed, although significant year classes should occur at a minimum of once every 5 years. This would apply to most of the South and North Saskatchewan Rivers and the Saskatchewan River. In lake populations at least 40 year-classes should be present in a restored population with 10 to 15% is made up of mature fish and 3% at age 40 or older (Holey et al. 2002). This would apply to shallow lakes such as Tobin Lake.

Fish density or abundance is usually defined as the amount of sturgeon found in a particular amount of habitat. Based on natural productivity and amount of habitat available sturgeon populations should include at least enough adults to provide a self-sustaining population. This population should support at least 5% exploitation rate if harvests occur.

For most of the sturgeon populations in Saskatchewan, not an extensive amount is known. There is missing data on many aspects of sturgeon abundance. Concern over sturgeon populations has grown over the past decade and we should do what ever is feasible to obtain the necessary information.

Four areas were selected for future fieldwork (Figure 5). In the South Saskatchewan, there are five sites in the Leader and one at the Muskoday Bridge. In the North Saskatchewan, the Lloydminster area includes three sites, Maymont/Borden area includes three sites, and Prince Albert includes 4 sites. In the Saskatchewan River, there are no sites chosen between The Forks and EBCampbell Dam, other fieldwork is already underway. Some of these areas include historical sites. Other important historical sites are located outside of these areas for example, Battle River and Fort-a-la-Corne.

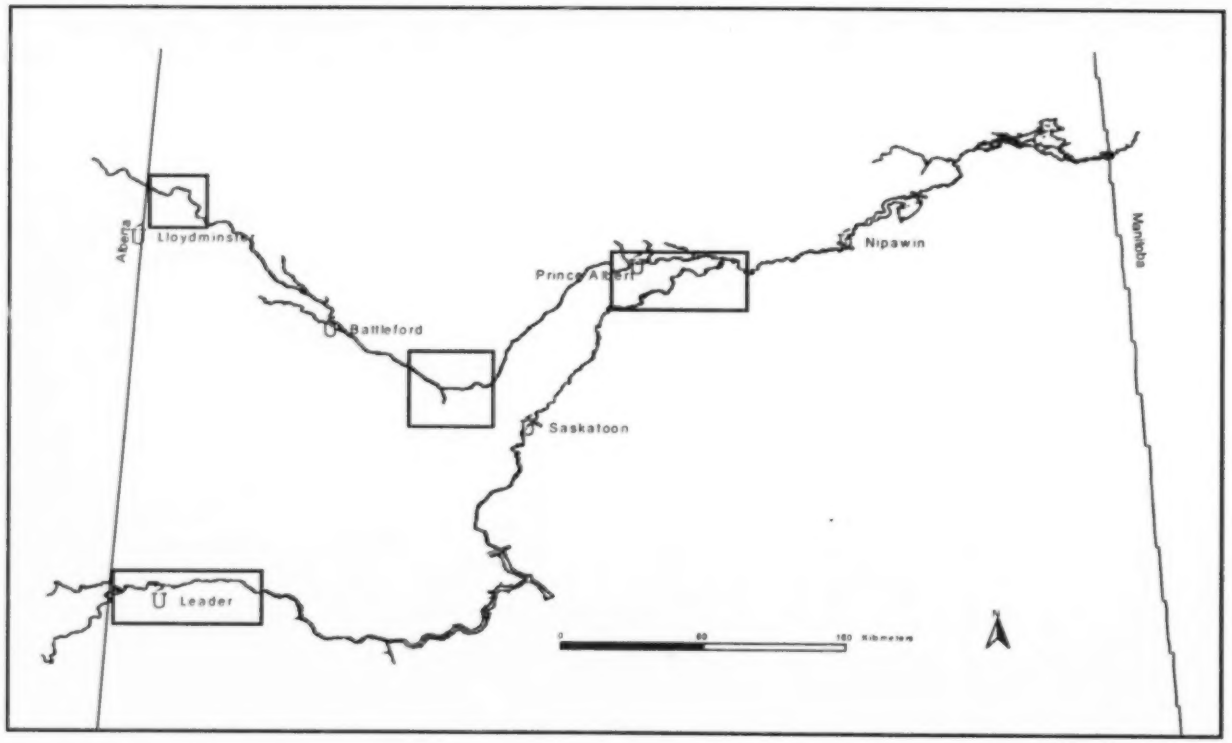

Figure 5. Areas for future fieldwork in Saskatchewan.

RECOMMENDATIONS

1. The "Sturgeon Spotters of Saskatchewan" program and surveys of anglers should continue, in order to obtain more anecdotal and historical data. Five or six communities would provide substantial information on sturgeon catch rates and sizes in Saskatchewan.

2. The historical and present locations for sturgeon should be used in any future fieldwork in the Saskatchewan Rivers. The focus should be on catch-per-effort, size composition and habitat criteria. These sites are mostly spawning and feeding sites.

3. Conservation officers and volunteer anglers should be contacted to make site identification and fishing more efficient. In the North Saskatchewan River, Alberta found this quite a useful approach. In Saskatchewan a few potential volunteers in each area have been located. Fieldwork using large–mesh gill nets and set-lines is suitable for adult sturgeon. Seining and electrofishing have proved useful in capturing juveniles.

4. The abundance of a few sturgeon populations in Saskatchewan should be determined. Catch-per-effort rates provides an index of abundance, which can be compared with historical abundance. Absolute abundance will require tagging fish in an ongoing mark/recapture program. Some tags could be distributed to areas where conservation officers are interested in educating a few choice volunteer anglers on the procedure.

5. A small number of fin rays for aging would confirm growth rates and show year class abundance. Genetic testing of some could also determine the number of spawners and level of genetic mixing. Locations of more preserved specimens should be obtained.

6. Investigations of habitat should include depth and velocity measurements and substrate and invertebrate samples at historical and present locations. Comparisons to 1915 conditions in the North Saskatchewan River and the Saskatchewan River proper would be useful. Determining small-scale habitat preferences would take substantial effort.

7. The effects of large dams and weirs on the main rivers and barriers on tributaries should be investigated. Known effects are as changes in seasonal flows, cooler temperatures below stratified reservoirs, disruption of spawning cues, lower prey densities, and sometimes, poor oxygen conditions. Dams also have detrimental effects on growth, reproduction, and seasonal migrations, which reduce genetic flows between isolated sturgeon populations.

8. Monitoring and educating anglers about the effects of incidental mortality, poaching, and over-harvests should continue. Anglers and conservation officers reported numerous occurrences of poaching at various sites in the summer of 2002 and previous years. Educating anglers about the ecological concerns regarding sturgeon populations as well as their economical and cultural importance may help to minimize poaching and keep subsistence fishing at sustainable levels.

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